Ser. No. 09/634,912 Docket No. 1344.1043

AMENDMENTS TO THE CLAIMS:

All pending claims are set forth below. Cancelled and withdrawn claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough.~~ The status of each claim is indicated with one of (original), (currently amended), (previously amended), (cancelled), (withdrawn), (new), (previously added), (reinstated - formerly claim #), (previously reinstated), (re-presented - formerly dependent claim #), or previously re-presented). Please AMEND claims 1, 18, and 31-35 and ADD new claim 36 in accordance with the following:

1. (currently amended) An optical amplifier for amplifying wavelength division multiplexed signal light which has respective optical signals of a first wavelength band of a C band containing a plurality of optical signals with several wavelengths different from each other and a second wavelength band of a L band containing a plurality of optical signals with several wavelengths different from the wavelengths of the optical signals contained in the first wavelength band, comprising:

optical amplifying means amplifying pump light in the first wavelength band ~~said wavelength division multiplexed signal light~~ using a rare earth element doped fiber to which excitation light is supplied;~~,~~ and

at least one parallel amplifying means that supplies residual pump light to provide Raman amplification in the second wavelength band that is different from the first wavelength band.

~~wherein the excitation light used by said optical amplifying means has a wavelength capable of producing Raman amplification with respect to optical signals of said second wavelength band, and~~

~~said optical amplifying means supplying said excitation light which has the wavelength capable of producing the Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying means, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been selectively Raman amplified by said Raman amplification producing medium, is input to said optical amplifying means.~~

2. (previously amended) An optical amplifier according to claim 1,

wherein there is provided demultiplexing means demultiplexing said wavelength division multiplexed signal light into respective optical signals of a first wavelength band and a second wavelength band, and multiplexing means multiplexing respective optical signals of the first wavelength band and the second wavelength band which have been demultiplexed by said

demultiplexing means,

said optical amplifying means has a first amplifying section amplifying optical signals of the first wavelength band which have been demultiplexed by said demultiplexing means, and a second amplifying section amplifying optical signals of the second wavelength band which have been demultiplexed by said demultiplexing means, and

said optical amplifying means supplying via said demultiplexing means a part of said excitation light used in said first amplifying section to said Raman amplification producing medium, so that optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input via said demultiplexing means to said second optical amplifying section.

3. (original) An optical amplifier according to claim 2, wherein when said first wavelength band is a 1550nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said first optical amplifying section contains a 1480nm band.

4. (previously amended) An optical amplifier according to claim 3, wherein said first optical amplifying section comprises an erbium doped fiber, at least one excitation light source generating excitation light of a 1480nm band, and an optical coupler supplying excitation light generated by said excitation light source to said erbium doped fiber from a rear side, wherein a part of said excitation light is passed through said erbium doped fiber and said demultiplexing means and supplied to said Raman amplification producing medium.

5. (previously amended) An optical amplifier according to claim 1, wherein there is provided demultiplexing means demultiplexing said wavelength division multiplexed signal light into respective optical signals of a first wavelength band and a second wavelength band, and multiplexing means multiplexing respective optical signals of the first wavelength band and the second wavelength band which have been demultiplexed by said demultiplexing means,

said optical amplifying means has a pre-stage amplifying section collectively amplifying said wavelength division multiplexed signal light input to said demultiplexing means, and a second optical amplifying section amplifying only optical signals of the second wavelength band which have been demultiplexed by said demultiplexing means, and

said optical amplifying means supplying a part of said excitation light used in a part of said pre-stage optical amplifying section to said Raman amplification producing medium, wavelength division multiplexed signal light which contains optical signals of said second wavelength band which have

been Raman amplified by said Raman amplification producing medium are input to said pre-stage optical amplifying section.

6. (original) An optical amplifier according to claim 5, wherein when said first wavelength band is a 1550nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said pre-stage optical amplifying section contains a 1480nm band.

7. (previously amended) An optical amplifier according to claim 6, wherein said pre-stage optical amplifying section comprises an erbium doped fiber, at least one excitation light source generating excitation light of a 1480nm band, and an optical coupler supplying excitation light generated by said excitation light source to said erbium doped fiber from a rear side, wherein a part of said excitation light is passed through said erbium doped fiber and supplied to said Raman amplification producing medium.

8. (original) An optical amplifier according to claim 1, wherein said Raman amplification producing medium is an optical fiber which is designed so that a non-linear effective cross section is small compared to a 1.3μm zero dispersion single mode fiber.

9. (previously amended) An optical amplifier according to claim 1, wherein said external transmission path is of a hybrid transmission path formed by connecting a positive dispersion fiber having a positive wavelength dispersion value and a positive dispersion slope with respect to a signal light wavelength band, and a negative dispersion fiber having a negative wavelength dispersion value and a negative dispersion slope with respect to the signal light wavelength band, wherein one end on the side of said negative dispersion fiber is arranged at an input side of said optical amplifying means and functions as said Raman amplification producing medium.

10. (previously amended) An optical amplifier according to claim 1, wherein there is provided optical power constant control means monitoring an output power of said wavelength division multiplexed signal light, and controlling an excitation light driving condition of said optical amplifying means so that said output power becomes constant.

11. (previously amended) An optical amplifier according to claim 1, wherein there is provided gain constant control means monitoring a gain in said optical amplifying means, and controlling an excitation light driving condition of said optical amplifying means so that said gain

becomes constant.

12. (previously amended) An optical amplifier according to claim 1, wherein there is provided supervisory control means processing a supervisory control signal transmitted together with said wavelength division multiplexed signal light.

13. (cancelled)

14. (previously amended) An optical amplifier according to claim 5 comprising:

first power monitor means monitoring the optical signal power of the first wavelength band which has been demultiplexed by said demultiplexing means;

second power monitor means monitoring the optical signal power of the second wavelength band which has been amplified by said second optical amplifying section; and

optical power deviation control means controlling the operation of at least one of said pre-stage optical amplifying section and said second optical amplifying section in response to the respective monitor results of the first and second power monitor means, so that the optical power deviation for the first and the second wavelength bands becomes constant.

15. (cancelled)

16. (cancelled)

17. (cancelled)

18. (currently amended) An optical amplifier for amplifying wavelength division multiplexed signal light which has respective optical signals of a first wavelength band of a C band containing a plurality of optical signals with several wavelengths different from each other and a second wavelength band of a L band containing a plurality of optical signals with several wavelengths different from the wavelengths of the optical signals contained in the first wavelength band, comprising:

an optical amplifying unit amplifying pump light in the first wavelength band ~~said wavelength division multiplexed signal light~~ using a rare earth element doped fiber to which excitation light is supplied;[,] and

at least one parallel amplifying unit that supplies residual pump light to provide Raman amplification in the second wavelength band that is different from the first wavelength band.

~~wherein the excitation light used by said optical amplifying unit has a wavelength capable of producing Raman amplification with respect to optical signals of said second wavelength band, and~~

~~said optical amplifying unit supplying said excitation light which has the wavelength capable of producing the Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying unit, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been selectively Raman amplified by said Raman amplification producing medium, is input to said optical amplifying unit.~~

19. (original) An optical amplifier according to claim 18,

wherein there is provided a demultiplexing unit demultiplexing said wavelength division multiplexed signal light into respective optical signals of a first wavelength band and a second wavelength band, and a multiplexing unit multiplexing respective optical signals of the first wavelength band and the second wavelength band which have been demultiplexed by said demultiplexing unit,

said optical amplifying unit has a first amplifying section amplifying optical signals of the first wavelength band which have been demultiplexed by said demultiplexing unit, and a second amplifying section amplifying optical signals of the second wavelength band which have been demultiplexed by said demultiplexing unit, and

said optical amplifying unit supplying via said demultiplexing unit a part of said excitation light used in said first amplifying section to said Raman amplification producing medium, so that optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input via said demultiplexing unit to said second optical amplifying section.

20. (original) An optical amplifier according to claim 19, wherein when said first wavelength band is a 1550nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said first optical amplifying section contains a 1480nm band.

21. (original) An optical amplifier according to claim 20, wherein said first optical amplifying section comprises an erbium doped fiber, at least one excitation light source generating excitation light of a 1480nm band, and an optical coupler supplying excitation light generated by said excitation light source to said erbium doped fiber from a rear side, wherein a part of said excitation light is passed through said erbium doped fiber and said demultiplexing unit and supplied to said Raman amplification producing medium.

22. (original) An optical amplifier according to claim 18, wherein there is provided a demultiplexing unit demultiplexing said wavelength division multiplexed signal light into respective optical signals of a first wavelength band and a second wavelength band, and a multiplexing unit multiplexing respective optical signals of the first wavelength band and the second wavelength band which have been demultiplexed by said demultiplexing unit,

said optical amplifying unit has a pre-stage amplifying section collectively amplifying said wavelength division multiplexed signal light input to said demultiplexing unit, and a second optical amplifying section amplifying only optical signals of the second wavelength band which have been demultiplexed by said demultiplexing unit, and

said optical amplifying unit supplying a part of said excitation light used in a part of said pre-stage optical amplifying section to said Raman amplification producing medium, wavelength division multiplexed signal light which contains optical signals of said second wavelength band which have been Raman amplified by said Raman amplification producing medium are input to said pre-stage optical amplifying section.

23. (original) An optical amplifier according to claim 22, wherein when said first wavelength band is a 1550nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said pre-stage optical amplifying section contains a 1480nm band.

24. (original) An optical amplifier according to claim 23, wherein said pre-stage optical amplifying section comprises:

an erbium doped fiber;

at least one excitation light source generating excitation light of a 1480nm band; and

an optical coupler supplying excitation light generated by said excitation light source to said erbium doped fiber from a rear side, wherein a part of said excitation light is passed through said erbium doped fiber and supplied to said Raman amplification producing medium.

25. (original) An optical amplifier according to claim 18, wherein said Raman amplification producing medium is an optical fiber which is designed so that a non-linear effective cross section is small compared to a 1.3μm zero dispersion single mode fiber.

26. (original) An optical amplifier according to claim 18, wherein said external transmission path is of a hybrid transmission path formed by connecting a positive dispersion fiber having a positive

wavelength dispersion value and a positive dispersion slope with respect to a signal light wavelength band, and a negative dispersion fiber having a negative wavelength dispersion value and a negative dispersion slope with respect to the signal light wavelength band, wherein one end on the side of said negative dispersion fiber is arranged at an input side of said optical amplifying unit and functions as said Raman amplification producing medium.

27. (original) An optical amplifier according to claim 18, wherein there is provided an optical power constant control unit monitoring an output power of said wavelength division multiplexed signal light, and controlling an excitation light driving condition of said optical amplifying unit so that said output power becomes constant.

28. (original) An optical amplifier according to claim 18, wherein there is provided a gain constant control unit monitoring a gain in said optical amplifying unit, and controlling an excitation light driving condition of said optical amplifying unit so that said gain becomes constant.

29. (original) An optical amplifier according to claim 18, wherein there is provided a supervisory control unit processing a supervisory control signal transmitted together with said wavelength division multiplexed signal light.

30. (original) An optical amplifier according to claim 22, further comprising:

a first power monitor unit monitoring the optical signal power of the first wavelength band which has been demultiplexed by said demultiplexing unit;

a second power monitor unit monitoring the optical signal power of the second wavelength band which has been amplified by said second optical amplifying section; and

an optical power deviation control unit controlling the operation of at least one of said pre-stage optical amplifying section and said second optical amplifying section in response to the respective monitor results of the first and second power monitor unit, so that the optical power deviation for the first and the second wavelength bands becomes constant.

31. (currently amended) An optical amplifier for amplifying wavelength division multiplexed signal light which has respective optical signals of a first wavelength band of a C band containing a plurality of optical signals with several wavelengths different from each other and a second wavelength band of a L band containing a plurality of optical signals with several wavelengths different from the wavelengths of the optical signals contained in the first wavelength band, comprising:

an optical amplifying unit amplifying a first wavelength band of said wavelength division multiplexed signal light; and

at least one residual amplifying pump supplying ~~an~~ a second wavelength band of excitation light ~~having a wavelength capable of producing~~ to produce a Raman amplification with respect to the optical signals of said second wavelength band. ~~to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying unit, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been selectively Raman amplified by said Raman amplification producing medium, is input to said optical amplifying unit.~~

32. (currently amended) An optical amplifier for amplifying wavelength division multiplexed signal light which has respective optical signals of a first wavelength band of a C band containing a plurality of optical signals with several wavelengths different from each other and a second wavelength band of a L band containing a plurality of optical signals with several wavelengths different from the wavelengths of the optical signals contained in the first wavelength band, comprising:

a first optical amplifier providing pump light in the first wavelength band; and

a second optical amplifier, in parallel with the first optical amplifier, providing Raman amplification in the second wavelength band. ~~optical amplifying means amplifying said wavelength division multiplexed signal light, and supplying an excitation light having a wavelength capable of producing a Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying means, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been selectively Raman amplified by said Raman amplification producing medium, is input to said optical amplifying means.~~

33. (currently amended) An optical amplifier, comprising:

an optical amplifying unit to amplify wavelength division multiplexed signal light which has respective optical signals of a first wavelength band of a C band containing a plurality of optical signals with several wavelengths different from each other to provide amplified C band signals; and

at least one parallel amplifying unit to amplify a second wavelength band of a L band containing a plurality of optical signals with several wavelengths different from the wavelengths of the optical signals contained in the first wavelength band, producing a Raman amplification with respect to the optical signals of said second wavelength band to provide amplified L band signals; and ~~wherein,~~

~~said optical amplifying unit amplifies said wavelength division multiplexed signal light, and supplies an excitation light having a wavelength capable of producing a Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying means, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been selectively Raman amplified by said Raman amplification producing medium, is input to said optical amplifying unit, and~~

a C/L ratio control section, controlling a balance between the amplified C band signals and the amplified L band signals. ~~a first wavelength band optical signal power and a second wavelength band optical signal power.~~

34. (currently amended) An optical amplifier receiving optical signals of a first wavelength band of a C band and a second separate wavelength band of a L band, wherein each wavelength band contains a plurality of optical signals of different wavelengths, said amplifier comprising:

a band demultiplexer providing a first band output and a second band output;

a first amplifier to provide pump light of the first band output;

~~an~~ a parallel amplifying unit ~~amplifying~~ to provide Raman amplification of residual pump light of the second band output;

a band multiplexer combining the pump light of the first band output and Raman amplified residual pump light of the second band output; ~~first band output and the amplified second band output;~~ and

a C/L ratio control section, controlling a balance between a first ~~wavelength band~~ optical signal power of the pump light of the first band output and a second ~~wavelength band~~ optical signal power of the Raman amplified residual pump light of the second band output.

35. (currently amended) An optical amplifying system receiving optical signals of a first wavelength band of a C band and a second separate wavelength band of a L band, wherein each wavelength band contains a plurality of optical signals of different wavelengths, said system comprising:

an optical amplifier selectively amplifying the optical signals of the ~~second~~ first wavelength band; ~~and~~

a Raman amplifier, arranged in parallel with the optical amplifier, selectively amplifying the optical signals of the second wavelength band; and

a C/L ratio control section, controlling a balance between a first ~~wavelength band~~ optical signal

power of the amplified optical signals of the first wavelength band and a second ~~wavelength band~~ optical signal power of the Raman amplified optical signals of the second wavelength band.

36. (new) An optical amplifier comprising:

a multi-band amplification section having first and second sides, comprising:

a C-band optical amplifier to amplify optical signals in a C-band with excitation light; and

an L-band optical amplifier to amplify optical signals in an L-band with excitation light, the L-band optical amplifier being provided in parallel with the C-band optical amplifier, the multi-band amplification section outputting residual excitation light from at least the first side thereof; and

a Ramen amplification unit provided in series with the multi-band amplification section, at the first side of the multi-band amplification section, to produce Ramen amplification for the optical signals in the L-band with the residual excitation light output from the multi-band amplification section.